A Physician Survey of Antimicrobial Stewardship Culture and Use of Antimicrobial Resistance Data and Resources

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Abstract

Objectives: To describe the physician-perceived functionality of antimicrobial resistance (AMR) data resources and use in practice by identifying (1) the types and quality of AMR resources and frequency of use in practice and (2) the current antibiotic stewardship culture across the state of Wisconsin.

Methods: An online survey evaluating physician use of AMR data resources and stewardship culture was distributed to Wisconsin Medical Society members.

Results: Online resources were the most commonly used AMR resource, with 38% of antibiotic prescribers reporting at least weekly use (n=16). Antibiograms, reference books, and literature searches were only used at least weekly by 13% of respondents. Respondent ranking (1=not at all, 7=very) for AMR data accessibility (mean 4.3±2.1), availability (4.4±2.2), functionality (4.8± 2.1), and interpretability (4.9± 2.0) averaged slightly above 'somewhat'. 'Antibiotic use monitoring' was the most recognized stewardship intervention, being employed often or always in 57% (n=12) of respondent's practice sites. Of antimicrobial stewardship interventions, both sample taken for culture before antibiotic treatment and de-escalation were reported by 53% of respondents as being present often or always. 'Prospective audit and feedback' and 'antibiotic use data reported to clinicians' were the least common stewardship interventions.

Conclusions: Opportunities exist for improving accessibility and quality of AMR resources in Wisconsin. Strengthening of prospective audit and feedback interventions and antibiotic use data provided to clinicians is needed. Pharmacists should be key contributors to antimicrobial stewardship efforts across practice settings.

Antimicrobial resistance (AMR) is a serious threat to global public health according to the World Health Organization.[1] If existing trends are not disrupted, AMR estimated deaths could total 10 million globally per year, with $100 trillion dollars in lost productivity by 2050.[2] Variations in AMR occur globally, nationally and locally due to multiple patient, social, and system factors. In a surveillance study across Wisconsin, regional and organism variations in antibiotic resistance were observed near urban centers.[3]

Antibiotics are key in treating bacterial infections, but they are commonly misused and unnecessarily prescribed.[4] According to the Centers of Disease Control (CDC) and a recent study of 184,032 outpatient visits, opportunity exists to improve the appropriate prescribing patterns of antibiotics in both inpatient and outpatient healthcare settings.[4,5] Pharmacists are pivotal to ensuring appropriate use of antimicrobials and are often key contributors to and leaders of stewardship programs.[6] The CDC's Core Elements of Hospital Antibiotic Stewardship Programs include appointing a single pharmacist leader responsible for working to improve antibiotic use.[7] Progressive antimicrobial stewardship teams are increasingly interdisciplinary, including front-line staff, and shifting from a raising awareness approach to a shared responsibility approach for improved antibiotic use.[8-10]

Many health systems document local AMR in the form of an antibiogram displaying bacterial susceptibility to select antibiotics.[11] Antibiograms are essential for antimicrobial stewardship, and they serve as a local resource to practitioners to facilitate empiric antibiotic selection.[12] However, functionality and practice gaps may exist in the availability and use of antibiogram data by practitioners. The objective of this study was to describe the physician-perceived functionality of AMR data resources and use in practice by identifying (1) the types and quality of AMR resources and frequency of use in practice, (2) the current antibiotic stewardship culture across the state of Wisconsin, including common stewardship strategies implemented in practice, and opportunities for improvement in current AMR resources and its use.

TABLE 1. Survey Respondent Demographics and Characteristics

Variable	Survey Question Respondents (%)*	Frequency of Prescribing Systemic Antibiotic					
		Rarely, 0-2 Times Per Week	Occasionally, 3-4 Times Per Week	A Least Daily, 5-30 Times Per Week	Frequently, 30+ Times Per Week	Never	Total (n)
Number of Respondenets		3	6	4	1	2	16
25-34 years	6%	0	0	0	1	0	1
35-44 years	19%	0	2	1	0	0	3
45-54 years	25%	0	3	1	0	0	4
55-64 years	38%	2	1	1	0	2	6
65 years or older	13%	1	0	1	0	0	2
Number of Respondenets		3	6	4	1	2	16
Time with electronic medical record (EMR) open during patient visits							
Yes - always	67%	0	6	4	0	0	10
Yes - >50% of the time	7%	0	0	0	1	0	1
Sometimes, <50% of the time	0%	0	0	0	0	0	0
No EMR use during visits	27%	3	0	0	0	1	4
Number of Respondenets		3	6	4	1	1	15
Type of antibiograms available at respondents' health system (if available)							
Inpatient	69%	2	4	4	1	0	11
Outpatient	38%	1	3	2	0	0	6
ICU	31%	0	2	2	1	0	5
Transplant	6%	0	1	0	0	0	1
Pediatrics ICU	0%	0	0	0	0	0	0
Emergency Department	6%	0	0	0	1	0	1
Trauma and life support	0%	0	0	0	0	0	0
No antibiogram at health system	19%	1	2	0	0	0	3
Number of respondents (n=16)		4	6	5	1	0	16*

*Respondent practice areas: general/internal/family medicine (n=7), emergency medicine (n=2), hospitalist (n=1), otolaryngology and allergy (n=1), private practice (n=1), occupational medicine (n=1). *Percentages rounded to whole number may total >100%.*
**Multiple types of antibiograms were reported by the sixteen respondents.*

Methods

This study is a survey of Wisconsin physicians regarding current availability and use of AMR resources, and practice site culture of antimicrobial stewardship. The University of Wisconsin-Madison Health Sciences Institutional Review Board exempted the study from further ethical approval.

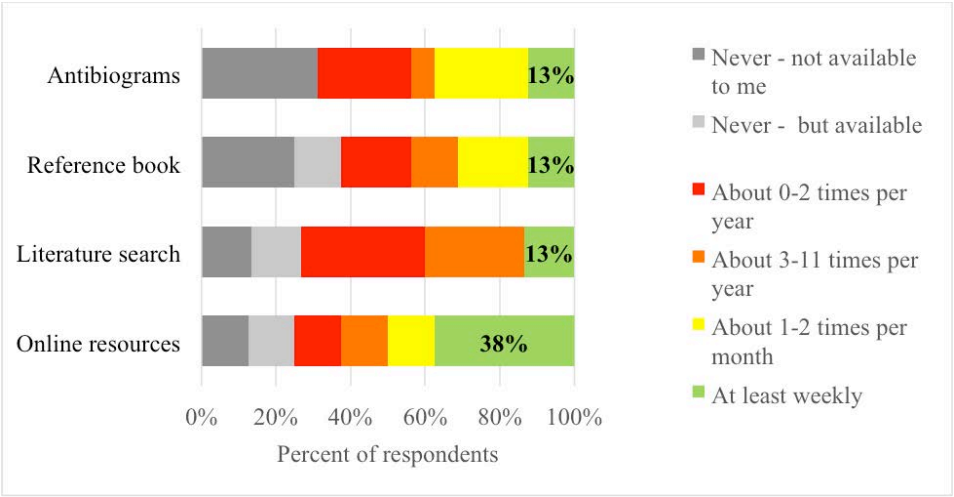
Survey Questions

Survey questions were developed by the pharmacists conducting this antimicrobial stewardship research with input from a small, multidisciplinary group of infectious diseases healthcare providers (infectious disease physicians, fellows, residents, a nurse practitioner, and a medical student). Survey questions included 5-point and 7-point unipolar scales as determined to be appropriate by survey developers. An individual not involved with the design of the survey reviewed the survey to identify any items that needed further clarification.

The survey collected information about 1) respondent demographics, 2) knowledge of AMR, 3) the use and availability of AMR resources (type and frequency of use), 4) quality of available AMR data, 5) antimicrobial stewardship culture and activities present at the participant's practice. This study defines antimicrobial stewardship culture as the antimicrobial stewardship attitudes and practices that characterize a healthcare setting. Questions asked about a participant's individual workplace setting, such as a practice site and their health system as a whole (ex. system hospitals and clinics).

The survey was designed to be completed by physicians who prescribe antibiotics, with branch logic to customize a respondent's path through the survey (Online Supplement). The survey totaled 24 questions with a five to ten minutes estimated completion time. An initial survey question asked participants how frequently he/she prescribes antibiotics.

FIGURE 1. Reported Frequency of Resources Used Over Previous Twelve Months (n=16)



Respondents who reported he/she never prescribe antibiotics were directed to questions about antimicrobial stewardship culture and AMR knowledge at their workplace and were not asked specific questions about resources used when prescribing antibiotics. Questions about use of AMR resources, specifically antibiograms, were not displayed for a participant if he/she indicated their health system did not have an antibiogram.

Survey Recruitment and Participants

Wisconsin Medical Society members were invited to participate in a voluntary, electronic Qualtrics® survey distributed via email in the Wisconsin Medical Society newsletter, 'Medigram', on June 2, 2016, with a reminder being sent on June 23, 2016. The survey remained open for four weeks following the initial invitation.

The Online Supplement can be found here: https://www.jpswi.org/jpswja18_supplement.html

Statistical Analysis

Demographic data were summarized with Excel and Qualtrics® as observed frequencies and percentages. Descriptive statistics were calculated for questions that have range responses (ex. 1-7). Multiple choice options were summarized as percentages of respondents for each question. Data was also summarized by practice area and frequency of prescribed antibiotics. Types of resources available were reported as the percent of respondents who had access to each type of resource, and the frequency of use from those who had access.

Results

Twenty-one Wisconsin physicians provided survey responses, including 16 antibiotic prescribing respondents. Sixteen respondents, including two of the non-antibiotic prescribing physicians, completed the demographics section (Table 1). Sample size varied for each question as a response was not required for every question to complete the survey. The most common age group reported was 55-64 years (38%) with 75% of respondents being male. The majority of respondents (67%) kept an electronic medical record (EMR) open during patient visits.

When asked about knowledge of AMR on a unipolar 5-point awareness scale (1=not at all, 3=somewhat, 5=extremely aware), awareness was highest for incidence of resistance of common pathogens (mean 3.1±1.3), followed by antibiotic specific resistance patterns (mean 3.0±1.2), pathogen specific resistance trends (mean 2.8±1.3), local changes in resistance by county (mean 2.7±1.3), and incidence of resistance for less common pathogens (mean 2.7±1.2); statewide distribution of antibiotic resistance had the lowest average awareness rating (mean 2.5±1.3, n=21).

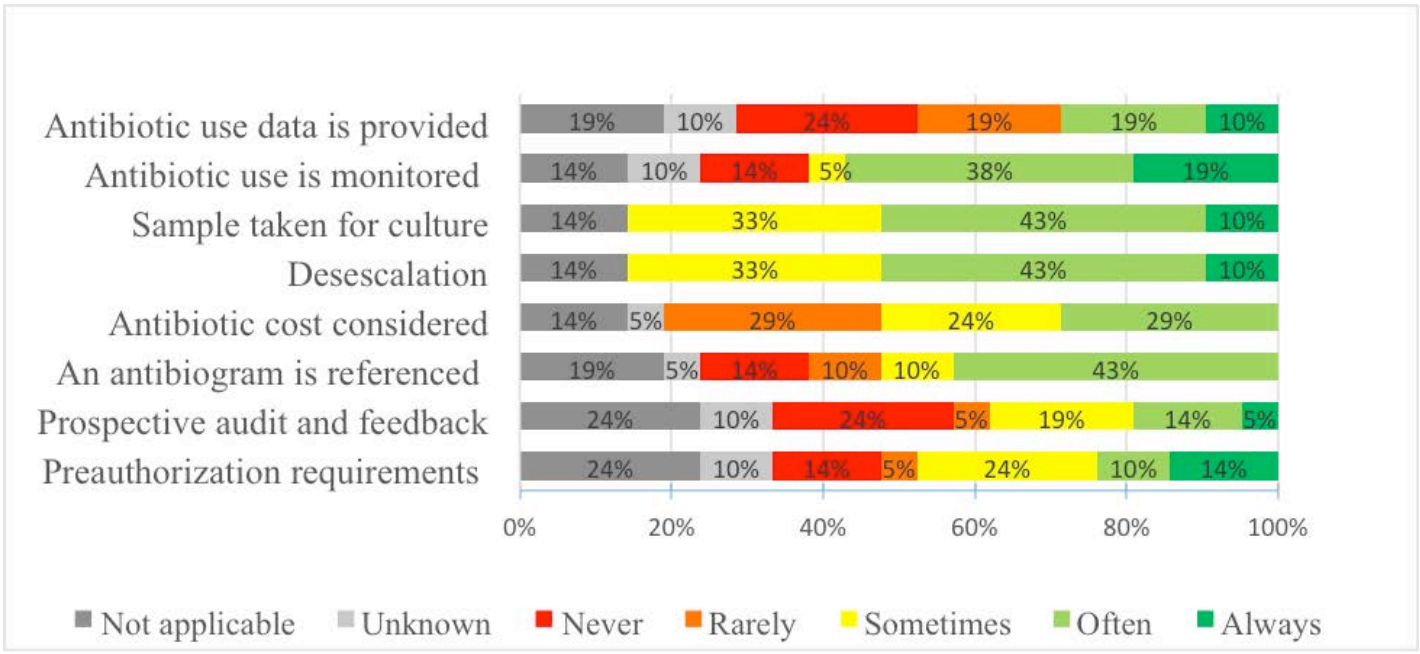
Online resources were the most commonly used type or AMR resource, with 38% of antibiotic prescribing respondents reporting at least weekly use (Figure 1). Antibiograms, reference books, and literature searches (an alternative to a specific resource) were only used at least weekly by 13% of the respondents. Antibiograms were available to 69% of antibiotic prescribing respondents, of whom 36% estimated use of 1-2 times per month and another 36% estimated use of 0-2 times per year.

Respondents were reportedly either self-taught (47%, n=7) or untrained (20%, n=3) in the use of antibiogram data; 33% (n=5) received training from someone else. When asked to describe their training one respondent stated their ID rotation in medical school was very helpful, while another respondent stated they would greatly appreciate training on AMR data. An independent provider added they no longer have access to AMR data since leaving a practice within a health system with a hospital.

Antibiotic prescribing respondents (n=16) were asked to consider the quality of AMR data in their practice environment in terms of accessibility, availability, functionality, and interpretability on a 7-point unipolar scale (1=not at all, 4=somewhat, 7=very). Data interpretability (mean 4.9± 2.0) and functionality (mean 4.8± 2.1) ranked more favorably than data availability (mean 4.4±2.2) and accessibility (mean 4.3±2.1).

When asked how much the respondent's health system or practice maintains a culture of antimicrobial stewardship (5-point unipolar scale: 1 = not at all, 3 = a moderate amount, 5 = a great deal), the fourth option, 'quite a lot', was the most common response (33%, n=7/21). 'Antibiotic use monitoring' was the most recognized stewardship intervention, being employed often or always in 57% (n=12) of respondent's practice sites (Figure 2). Both sample taken for culture before antibiotic treatment and de-escalation were also reported by 53% of respondents as being present often or always. 'Prospective audit and feedback' and 'antibiotic use data reported to clinicians' were the least common stewardship interventions. When asked how much changing the presentation of AMR data with visualizations would improve the translation of AMR data into practice on a 5-point scale (0 = not at all, 3 = somewhat, 5 = a great deal), the majority

FIGURE 2. Reported Responses to Type(s) of Antimicrobial Stewardship Components Present? (n=21)



of respondents indicated 'a great deal' (57%, n=12).

Discussion

The results of our survey identify an opportunity to improve frequency of AMR data use in practice and AMR data quality, especially improving data access and availability. The physicians surveyed used online resources more frequently than local antibiograms for AMR data. Use of local AMR data, including antibiogram data, may be improved with a clear pathway for online access. Education on interpretation of antibiogram data may facilitate increased frequency of use and appropriate antibiotic prescribing considering local antibiotic resistance. These results and the survey comments also identified an opportunity to improve knowledge of AMR resource availability. The results of this study are consistent with a survey to spinal cord injury physicians finding deficits in antibiogram access and awareness.[13] The 2016 guidelines for implementing an antibiotic stewardship program recommend the development of stratified antibiograms (e.g. by age or location) to reveal susceptibility differences.[12] Educating clinicians about AMR and optimal prescribing is also one of the CDC Core Elements of Hospital Antibiotic Stewardship, now required for reimbursement from the Centers for Medicare and Medicaid Services and included in the Joint Commission Antimicrobial Stewardship Standard.[7,14] Regular reporting of antibiotic resistance to providers is also a CDC Core Element that could be achieved with improved AMR data resources. This regulatory climate necessitates pharmacist leadership within antimicrobial stewardship teams to achieve the Core Elements and provide needed education.

The extent of antimicrobial stewardship culture and strategies implemented are variable across Wisconsin. Achievements include high reporting of antibiotic use monitoring, samples taken for culture before antibiotic treatment, and the use of de-escalation. Similar to a national antibiotic stewardship survey, prospective audit and feedback remains the area of greatest opportunity in antimicrobial stewardship program implementation.[15] Pharmacists are the drivers of antimicrobial stewardship interventions. The survey developed and results could be a valuable tool for pharmacy departments to benchmark currently available AMR resources and stewardship strategies and may provide justification for adding or expanding an antimicrobial stewardship program.

A low response rate may have confounded the data. The survey was expected to reach 14,000 Wisconsin Medical Society members. Practitioners involved in antimicrobial stewardship initiatives or interested in antibiotic resistance potentially were biased toward favorable results by their propensity to respond to the focused survey. Although the response rate was low, physician satisfaction with AMR data resources varied greatly among respondents, suggesting diversity in the respondent AMR expertise and resource access. For example, responses to data availability included both 'not at all' and 'very'. More than 50% of respondents stated they worked in general, internal, or family medicine, and were current antibiotic prescribers (Table 1). The survey results and answers are subject to interpretation by the respondents. The survey questions were developed by the research team due to a lack of AMR resource surveys published in the literature. Therefore, these results need further validation through additional distributions, including to pharmacists and other healthcare professionals. We subsequently scaled this initial pilot survey in Wisconsin to a multidisciplinary national distribution.

Conclusion

As national efforts accumulate to address the threat of AMR, the results

of this survey identified a lag in access to AMR quality data. Results of this survey support improving the availability and quality of online AMR data resources and education about interpretation or translation of data into practice. High quality AMR resources should be available to all healthcare providers across the continuum of care. Pharmacists have a responsibility to ensure appropriate antimicrobial use in all practice settings. Pharmacists can also be instrumental in antimicrobial stewardship education efforts now mandated by multiple regulatory agencies. The results identify areas of opportunity for pharmacists in increasing stewardship strategies, such as prospective audit and feedback. These efforts may increase appropriate antibiotic prescribing and strengthen antimicrobial stewardship across Wisconsin.

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